Response to Lord Drayson's speech from Lord Rees of Ludlow OM Kt PRS, President of The Royal Society at The Foundation for Science and Technology meeting on 4th February, 2009.

We should all welcome the challenge of Paul Drayson's remarks -- and the dynamism he brings to his role. His Government, from the Prime Minister downwards, has sustained a positive commitment to science throughout the past 12 years. The payoff sometimes takes decades, rather than years -- the tap can't be turned off and then back on. So we mustn't slip backwards, or even stand still, during the recession.

Here in the UK we should specially welcome government initiatives to finance high-tech start-ups, at a time when the early-stage venture capital market has dried up. Others better qualified than me will address these issues later.

I'll focus my remarks on 'academic' research. In this endeavour, second rate work counts for very little -- excellence is all. And indeed the Royal Society's prime aim -- indeed our strapline --is to foster excellence in science.

Paul noted that, as a scientific nation, the UK was, by most indicators, second only to the US. It's important to recognise why this is so. It's largely because of our strong research universities. We're the only country outside the US to have several in the premier league.

The most readily measurable economic benefit of academic research is direct knowledge transfer from university labs to industry. But research universities fulfil other key roles, harder to quantify. They're networked with the whole world's research. Their core mission is to educate outstanding graduates, who will spread expertise throughout the private and public sector, who can recognise the exploitability of a new idea from anywhere in the world and run with it.

In the US, the exemplars are Harvard and Stanford. They're esteemed as major national assets, because of their attraction for international talent, the collective expertise of their faculty, and the consequent quality of their graduates. They are embedded in a 'cluster' of research laboratories, small companies, NGOs, and so forth -- to symbiotic benefit. But-- and it's important to realise this -- they are themselves primarily academic, rather than 'applied" institutions.

The same is true here in the UK. In the clusters that great universities attract around them, talent attracts talent (and big companies too). Success breeds success -- and, just as important, failure is accepted as a step towards later success. In places like Cambridge, a dynamic and interactive high-tech community has developed that offers, in the words of the FT , a "low risk place to do high risk things".

When nerds like me argue for curiosity driven research, they risk being

accused of an ivory tower attitude that disregards our obligations to the public. But I'd strongly contest that accusation -- excellent universities are of immense economic and social value to the nation. Much of economic growth can be traced back to research that starts in them. They're a key asset -- a crucial investment -- but they're vulnerable

I'm fortunate to know most of the leading UK scientists -- those who've won Nobel prizes or the equivalent. They are all individualists, but there's one thing they'd agree on: they would highlight the long-term nature of their work, the unpredictability of its outcome, and the need for a supportive environment. (Sir Martin Evans, the stem cell pioneer -- made this point forcefully when he spoke in this room just a few months ago).

It's crucial to ensure that government funding for academic research is channelled optimally -- and that we maximise the multiplier effect from supplementary private funding.

It's in this context that we need to address the issue of "strategic choices" -- in particular, the balance between responsive mode public funding and targeted specific programmes.

To ensure that our universties stay competitive, it's crucial that attract and retain outstanding faculty. Once quality is lost, it's very hard indeed to recover it. Traditionally, there's an implicit contract that faculty have with their institution: relative autonomy, and the prospect, without undue hassle, of gaining 'responsive mode' funding for the research to which they're prepared to dedicate their lives. (That's a fair expectation if you're at Harvard or Stanford; it must be so here if we're to compete for mobile talent at the highest academic level). So it would be a real 'own goal' to erode the availability of 'responsive mode' funding, which now comes mainly from Research Councils.

There's a symbiosis between applied and pure science -- one of my Royal Society predecessors, George Porter, averred that there were two kinds of science; applied and not yet applied.

Paul Drayson made his fortune in pharmaceuticals. His career exemplifies the difference an outstanding individual can make. His industry's success is grounded in the UK's strong research base in biomedical sciences. And that base is strong because government support of biomedical sciences is supplemented by the Wellcome Trust, major cancer charities, and of course the heavy R and D spend of the industry itself.

A broad constituency is now urging the need for sustained public support for physical sciences -- mathematics, all of physics, materials science chemistry and engineering: perhaps even for a rebalancing of public funding to allow a 'catch up' by these subjects after the prioritising of medical research in recent years. The advocates for 'breadth' in basic science includes biomedical researchers themselves. Paul Nurse had a fine letter in the Times last week. The heads of the MRC and Wellcome Trust have spoken in

similar vein about the need to sustain physical sciences. These academic subjects are vulnerable becuase they can't draw on supplementary sources that match the Wellcome Trust etc.

Cross-disciplinary expertise is now at a premium. Peter Mansfield's Nobel Prizewinning work on MRI was done in Nottingham's physics department. The exciting new field of synthetic biology involves physics and engineering. Computer science pervades all of biology.

I'd argue therefore that at the academic level it's in our interests to support real excellence right across the board -- and indeed it's affordable even in these straitened times (Research Council and HEFCE QE funds being the main sources). But 'strategic choices' -- and a concentration of effort -- are needed when we confront more costly development, rather than the prior research. But here it's commercial criteria-- albeit influenced by government regulatory and tax policy -- which will determine priorities.

In making these necessary hard choices, we should plainly do all we can to sustain and exploit our areas of current excellence in biotech. But what about other sectors based on physical sciences?

Paul Drayson's earlier ministerial stint at the MoD, where he oversaw procurement of high-tech equipment, will have convinced him that our manufacturing sector in physics-based industry, is patchy. There is a paucity of major high-tech manufacturing companies in the UK -- we have Rolls Royce (itself increasingly diversified away from the UK) , but few others like it. Indeed the weakness of our electronics industry stems from shortsighted policies and lost opportunities in the 1970s and 1980s form which lessons can surely be learnt.

Surely we should invest in efforts to redress this --to broaden our manufacturing base -- and to seize new opportunities. R and D on energy is currently, worldwide, at far too low a level to meet the global challenge -- anomalously low compared the scale of medical and health R and D. It is moreover a strategic area where we could align with the expanding US effort to mutual benefit. And I can't think of anything that would do more to attract young people into physical sciences than a proclaimed national aim to lead the quest for clean energy for the developing and the developed world.

Finally, ladies and gentlemen, a bit of jingoism and positive thinking. Britain has a great scientific tradition and great scientific strength today: we must build on it and aspire to be the best country in the world in which to do science. If we can, benign positive feedbacks come into play; the law of increasing returns applies; talent attracts talent.

We don't know what will be the 21st century counterparts of quantum theory, the double helix and the computer -- nor where the great innovators of the future will get their formative training and inspiration. But one

thing seems a near certainty: unless we get smarter, we'll get poorer. The UK's relative standing will sink unless we keep our competitive edge as discoverers and innovators -- unless some of the key creative ideas of the 21st century germinate and -- even more - are exploited here in the UK.